FIG. 1

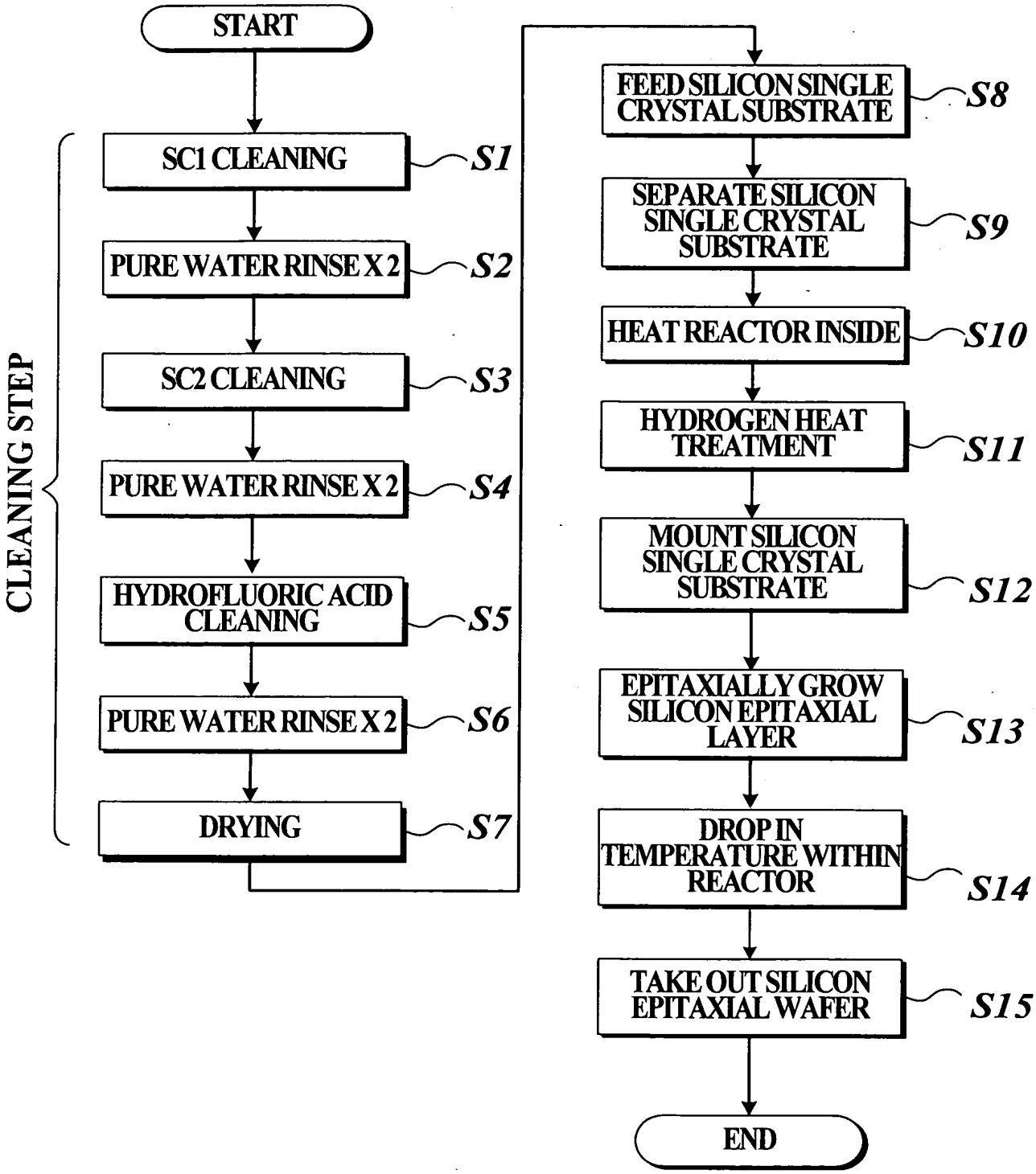

START
SC1 CLEANING
S1
PURE WATER RINSE X 2
S2
SC2 CLEANING
S3
PURE WATER RINSE X 2
S4
HYDROFLUORIC ACID CLEANING
S5
PURE WATER RINSE X 2
S6
DRYING
S7
CLEANING STEP
FEED SILICON SINGLE CRYSTAL SUBSTRATE
S8
SEPARATE SILICON SINGLE CRYSTAL SUBSTRATE
S9
HEAT REACTOR INSIDE
S10
HYDROGEN HEAT TREATMENT
S11
MOUNT SILICON SINGLE CRYSTAL SUBSTRATE
S12
EPITAXIALLY GROW SILICON EPITAXIAL LAYER
S13
DROP IN TEMPERATURE WITHIN REACTOR
S14
TAKE OUT SILICON EPITAXIAL WAFER
S15
END

FIG. 2

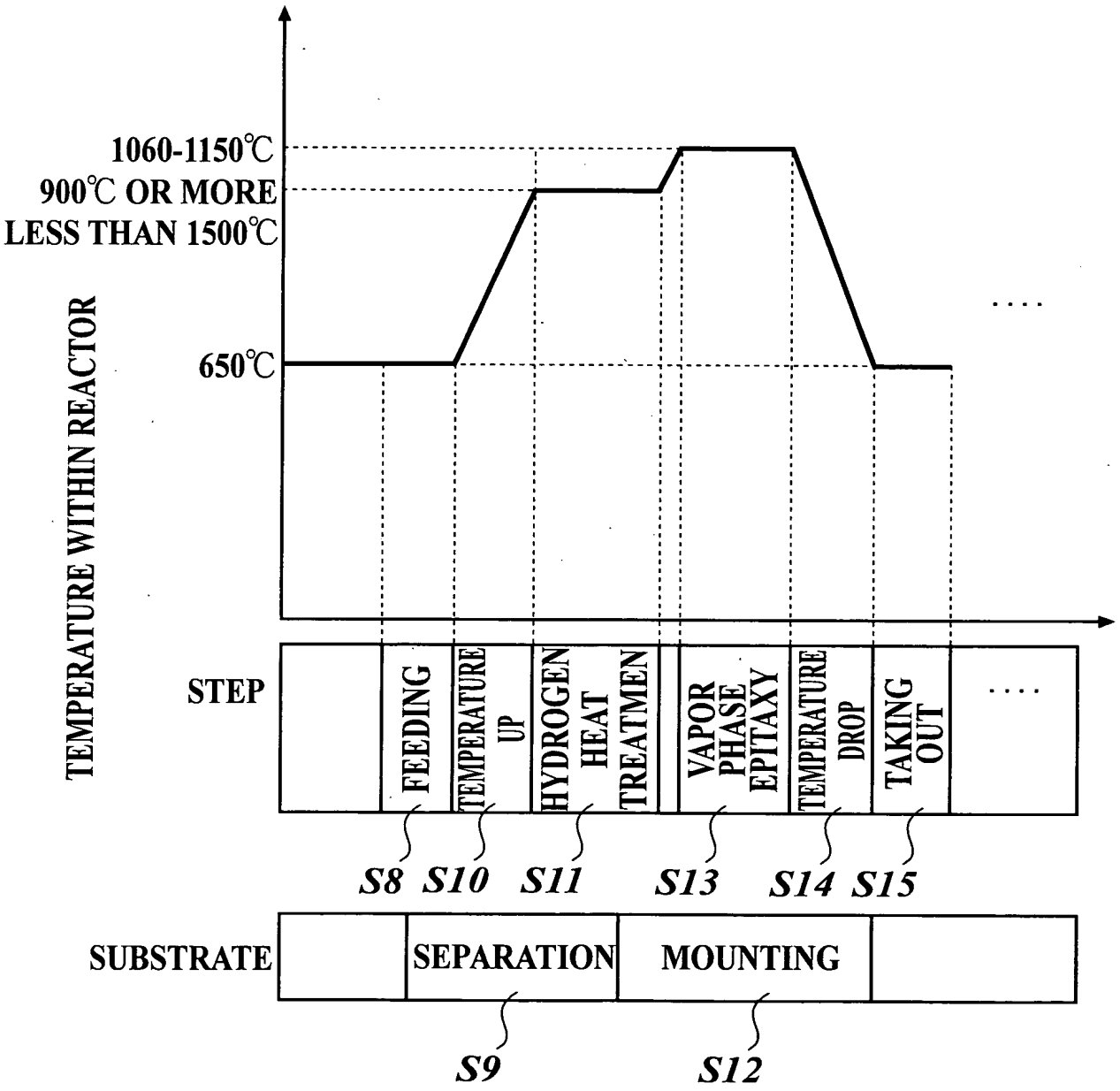

1060-1150℃
900℃ OR MORE
LESS THAN 1500℃
650℃
TEMPERATURE WITHIN REACTOR
STEP
FEEDING
TEMPERATURE UP
HYDROGEN HEAT TREATMEN
VAPOR PHASE EPITAXY
TEMPERATURE DROP
TAKING OUT
S8
S10
S11
S13
S14
S15
SUBSTRATE
SEPARATION
MOUNTING
S9
S12

FIG. 3

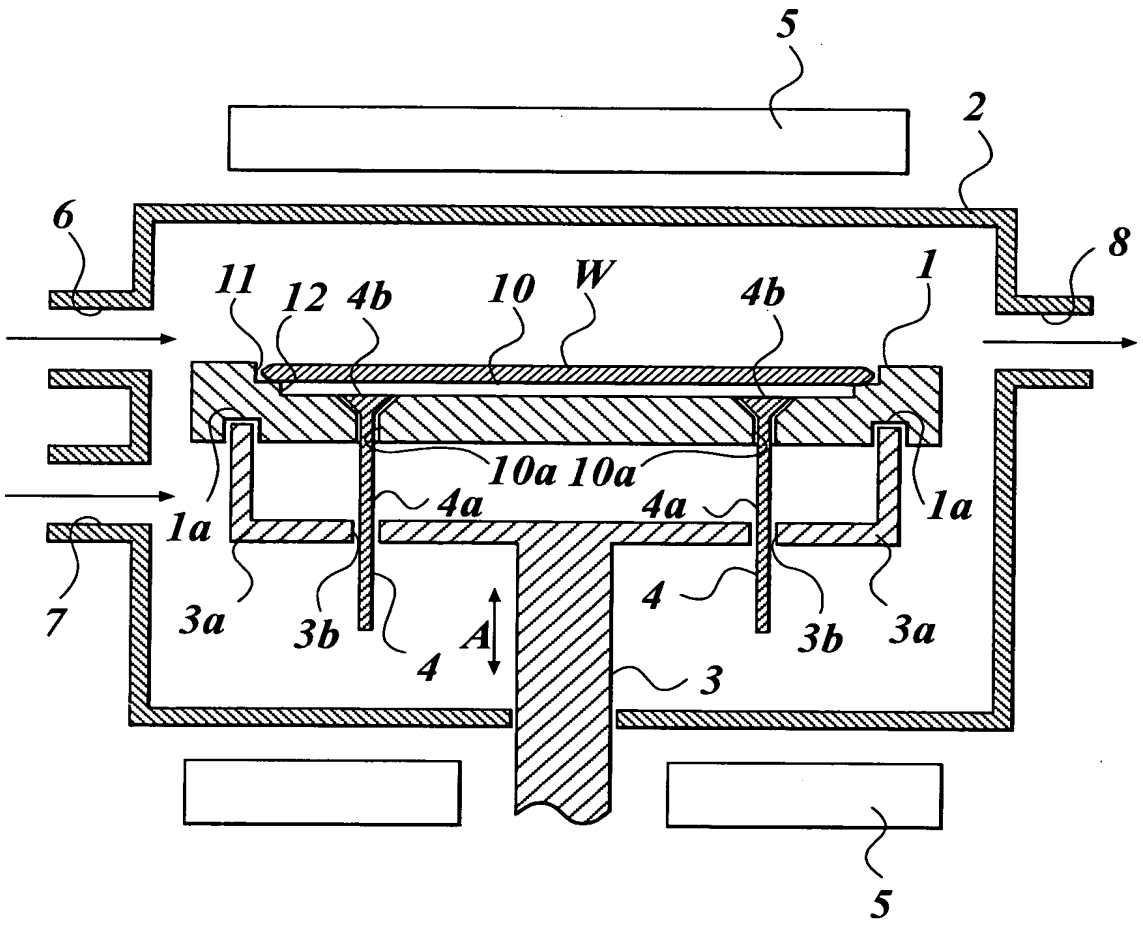


FIG. 4

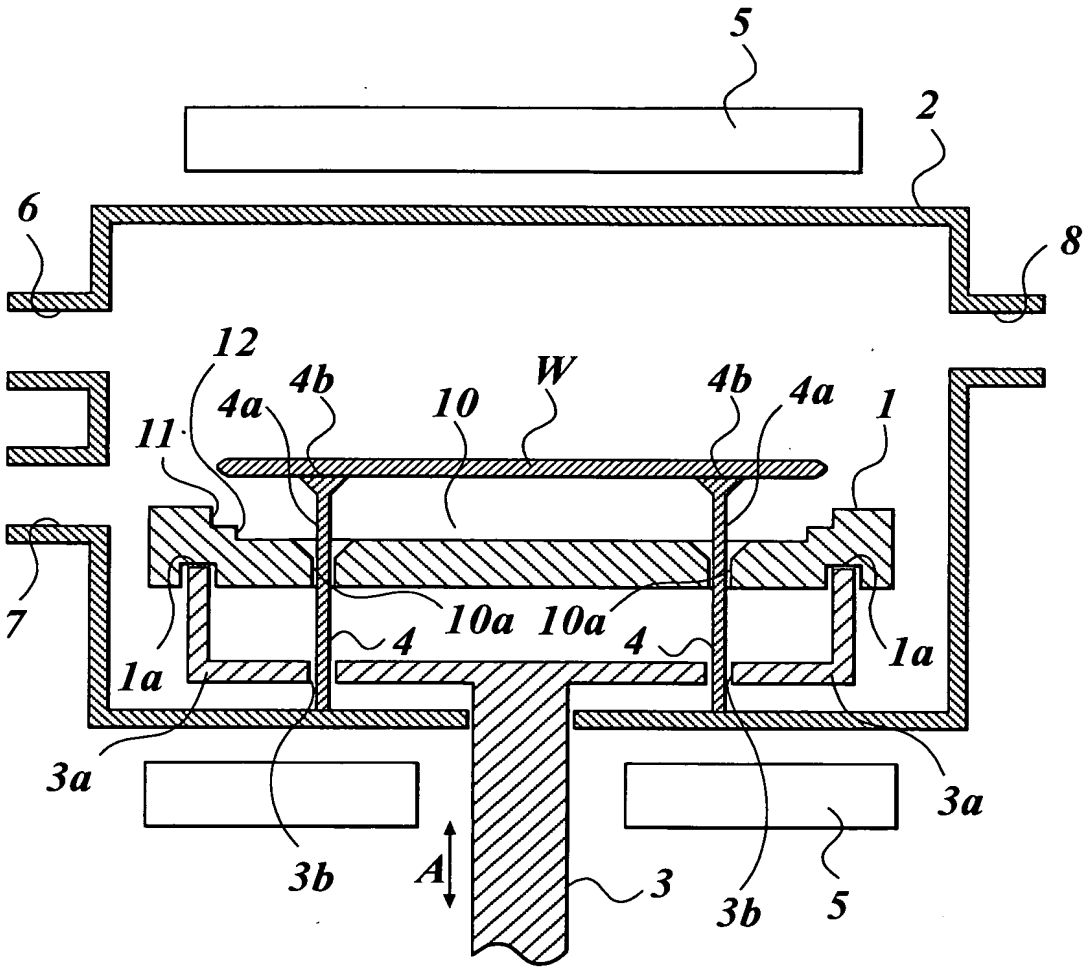


FIG. 5

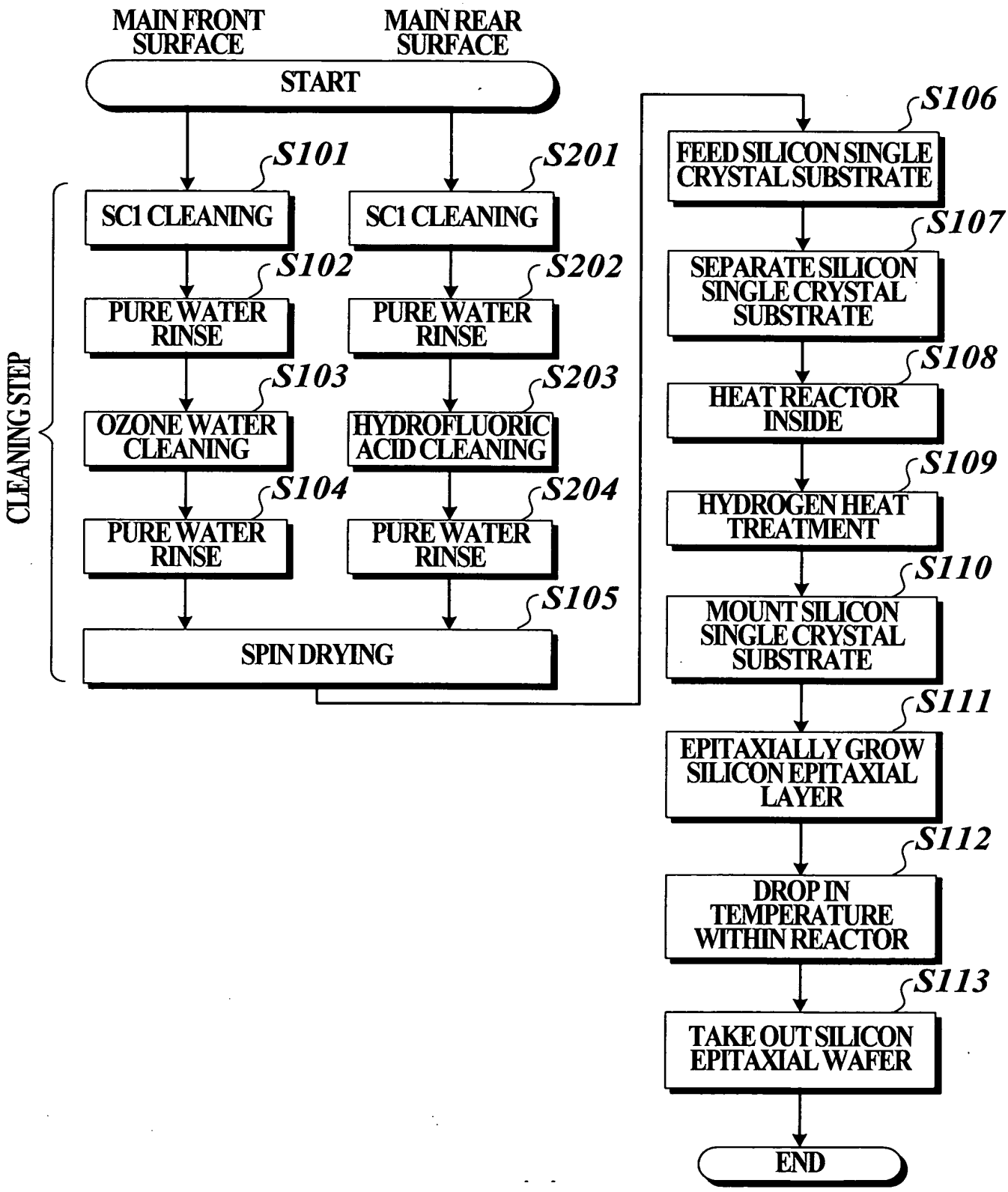

MAIN FRONT SURFACE
MAIN REAR SURFACE
START
S101
SC1 CLEANING
S102
PURE WATER RINSE
S103
OZONE WATER CLEANING
S104
PURE WATER RINSE
S201
SC1 CLEANING
S202
PURE WATER RINSE
S203
HYDROFLUORIC ACID CLEANING
S204
PURE WATER RINSE
S105
SPIN DRYING
CLEANING STEP
S106
FEED SILICON SINGLE CRYSTAL SUBSTRATE
S107
SEPARATE SILICON SINGLE CRYSTAL SUBSTRATE
S108
HEAT REACTOR INSIDE
S109
HYDROGEN HEAT TREATMENT
S110
MOUNT SILICON SINGLE CRYSTAL SUBSTRATE
S111
EPITAXIALLY GROW SILICON EPITAXIAL LAYER
S112
DROP IN TEMPERATURE WITHIN REACTOR
S113
TAKE OUT SILICON EPITAXIAL WAFER
END

FIG. 6A

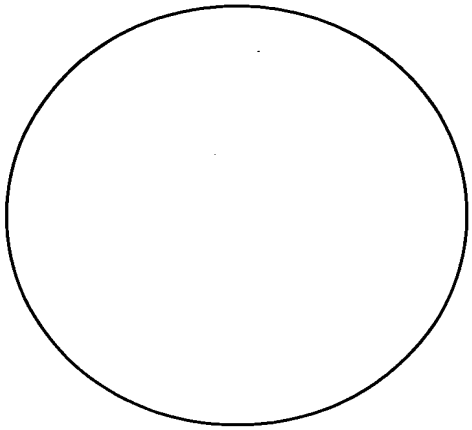


FIG. 6B

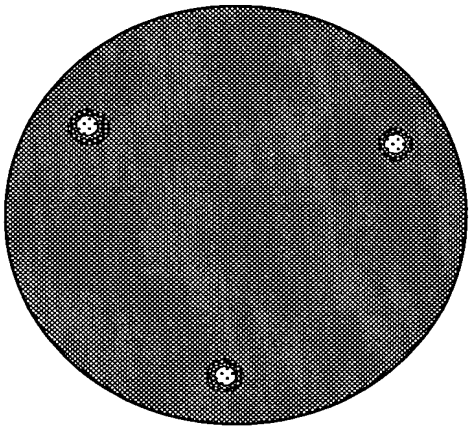


FIG. 7A

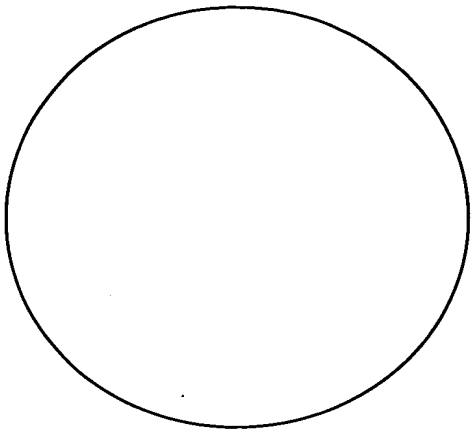


FIG. 7B

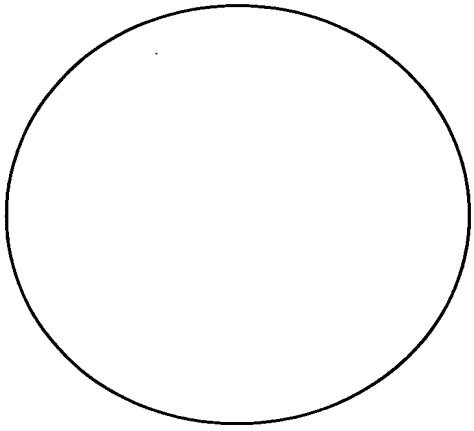


FIG. 7C

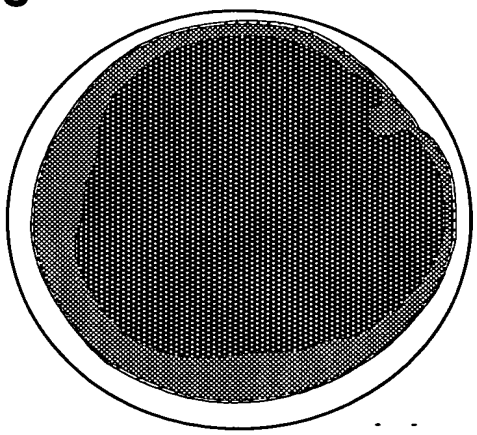
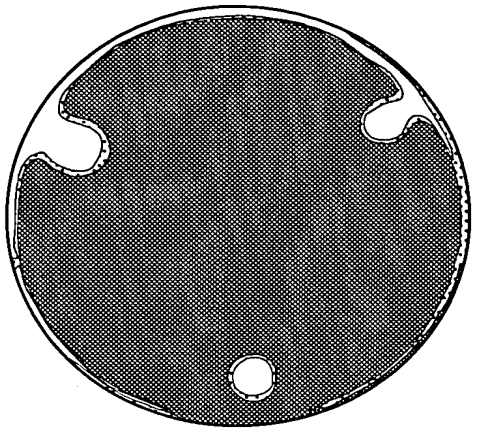
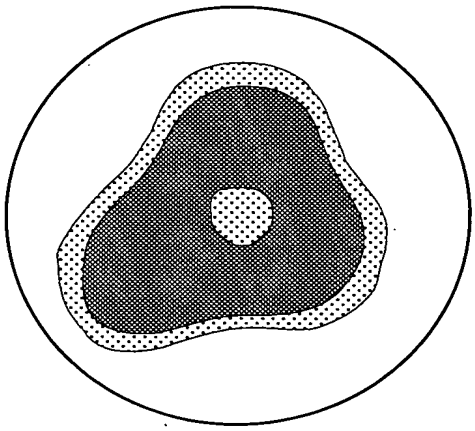


FIG. 8A



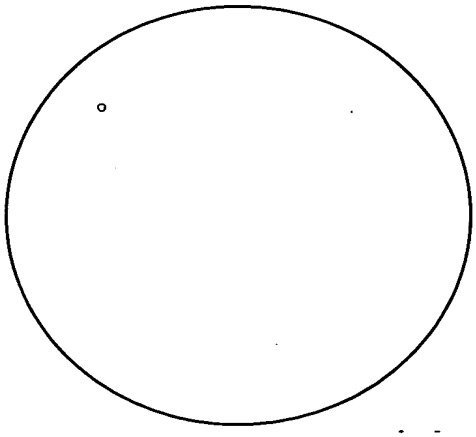
0.1≤x≤0.2
0.2<x≤0.5
0.5<x≤50

FIG. 8B



0.1≤x≤0.2
0.2<x≤0.5
0.5<x≤50

FIG. 8C



0.1≤x≤0.2
0.2<x≤0.5

FIG. 9A

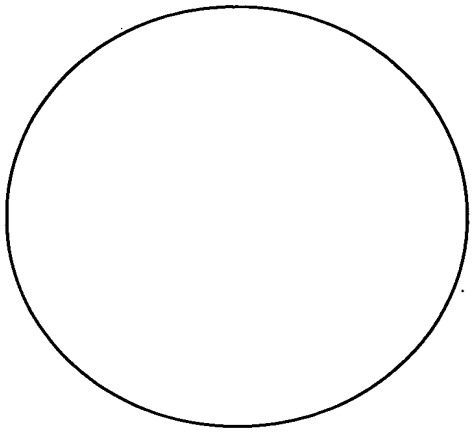


FIG. 9B

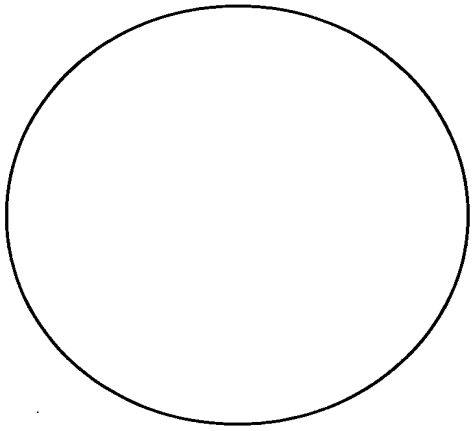


FIG. 9C

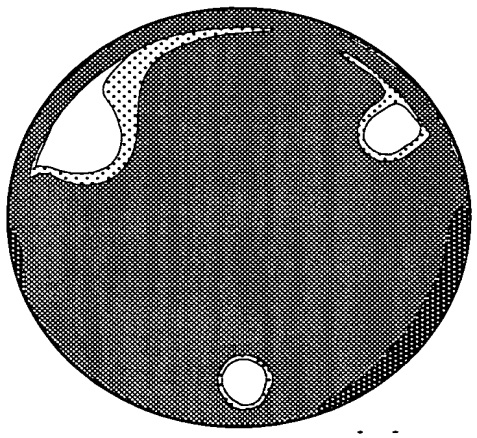


FIG. 10A

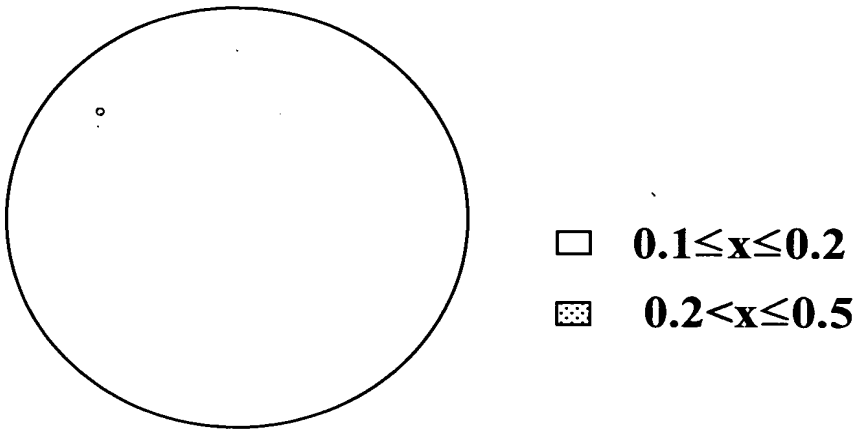


FIG. 10B

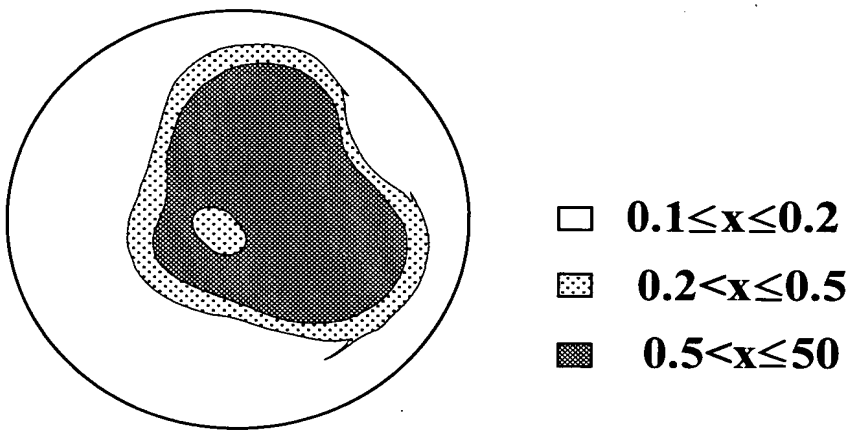


FIG. 10C

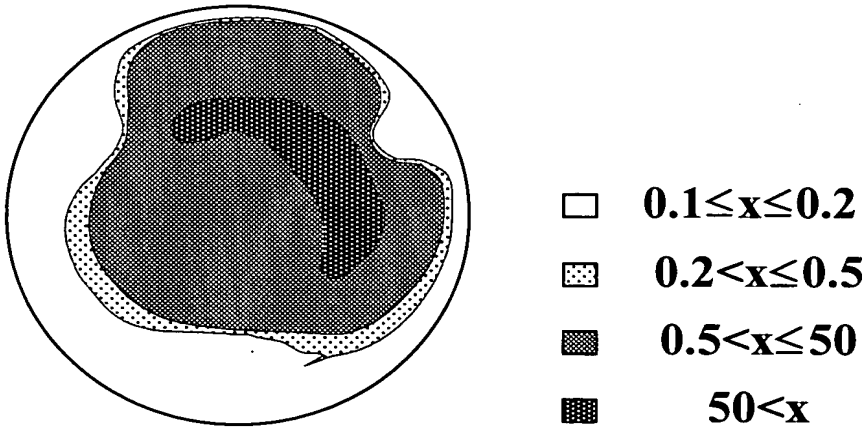
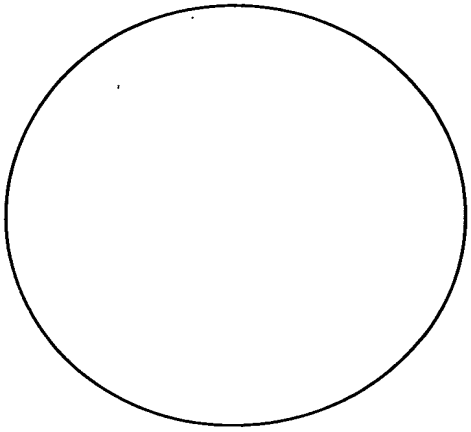
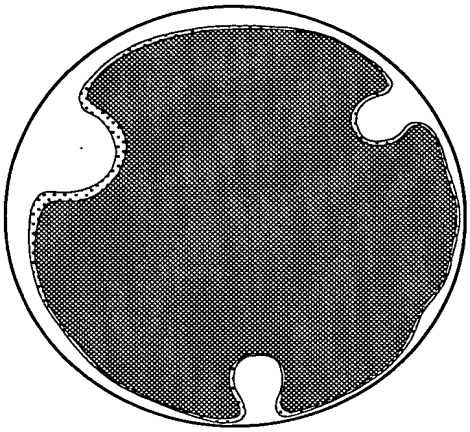


FIG. 11A



□ 0.1≤x≤0.2

FIG. 11C

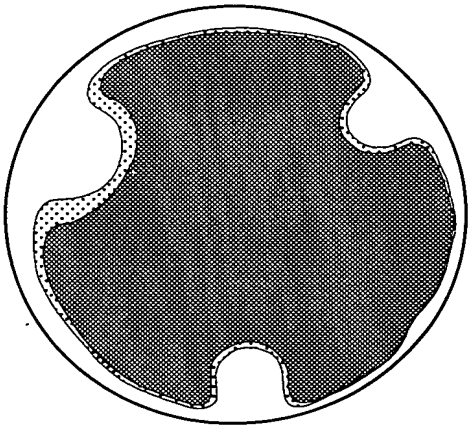


□ 0.1≤x≤0.2

▨ 0.2<x≤0.5

■ 0.5<x≤50

FIG. 11B

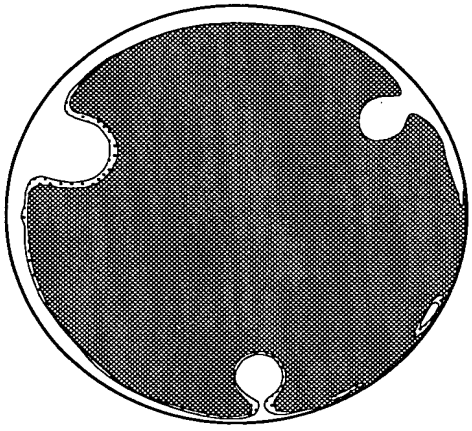


□ 0.1≤x≤0.2

▨ 0.2<x≤0.5

■ 0.5<x≤50

FIG. 11D

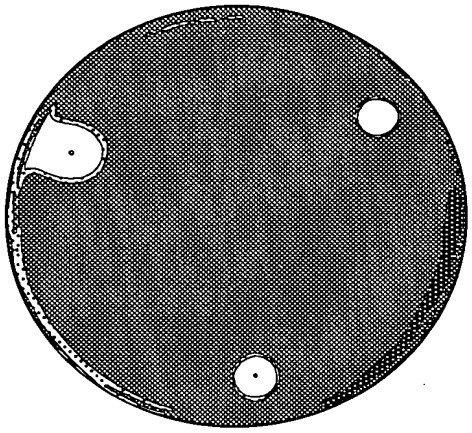


□ 0.1≤x≤0.2

▨ 0.2<x≤0.5

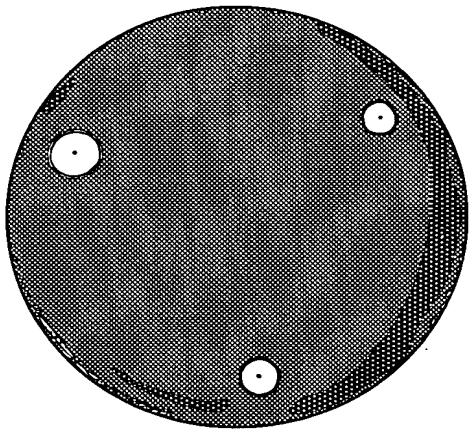
■ 0.5<x≤50

FIG. 12A



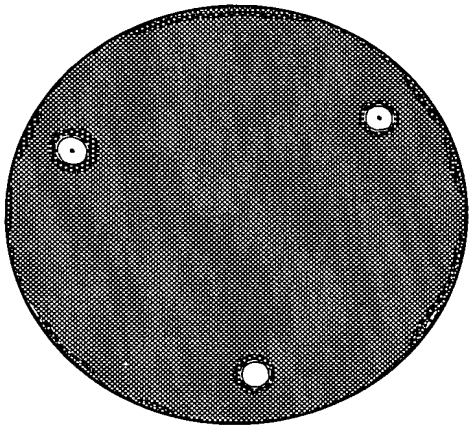
- 0.1≤x≤0.2
- 0.2<x≤0.5
- 0.5<x≤50
- 50<x

FIG. 12C



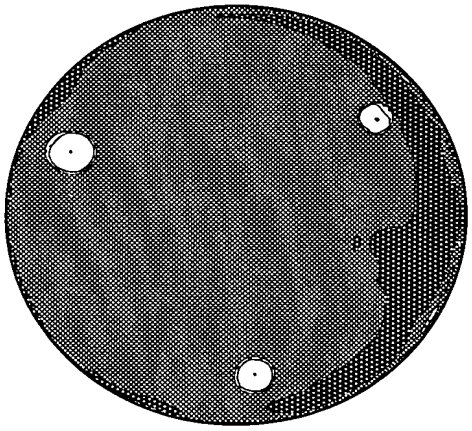
- 0.1≤x≤0.2
- 0.2<x≤0.5
- 0.5<x≤50
- 50<x

FIG. 12B



- 0.1≤x≤0.2
- 0.2<x≤0.5
- 0.5<x≤50
- 50<x

FIG. 12D



- 0.1≤x≤0.2
- 0.2<x≤0.5
- 0.5<x≤50
- 50<x

BEST AVAILABLE COP